

CLAIMS

1. An electronic device having mounted thereon a microelectromechanical system element comprising a micromachine component and electronic component for  
5 operation of said micromachine component formed on a substrate, in which

an operating space for said micromachine component is defined by said substrate and a lid bonded covering an active surface of said substrate, and  
10 said electronic component and wiring patterns of said lid are electrically connected at a bonded part of said substrate and said lid.

2. An electronic device as set forth in claim 1, in which said bonded part is an ultrasonic bonded part of  
15 said substrate and said lid.

3. An electronic device as set forth in claim 1 or 2, in which said substrate and/or said lid further have a cavity at said operating space side.

4. An electronic device as set forth in claim 1 or  
20 2, in which said substrate and a lid having no wiring pattern further comprise, between them, an intermediate member provided with an opening for operation of said micromachine component and wiring patterns and said electronic component and the wiring patterns of said  
25 intermediate member are electrically connected.

5. An electronic device as set forth in claim 2, in which said substrate, said lid, and an intermediate member arranged in accordance with need between said substrate and said lid further comprise a second  
30 continuous ultrasonic bonded part formed in contact with an outer periphery of said operating space side of said substrate and other members without interruption.

6. An electronic device as set forth in claim 1 or 2, in which said substrate and/or said lid further  
35 comprise conductor-filled vias formed passing through them in a thickness direction.

7. An electronic device as set forth in claim 4,

in which said intermediate member further comprises conductor-filled vias formed passing through it in a thickness direction.

5       8.    An electronic device as set forth in claim 1 or 2, which further comprises a bonded sealing resin surrounding an outside surface of said bonded part.

10       9.    An electronic device as set forth in claim 1 or 2, in which a plurality of said electronic devices are those produced batch-wise at the same time by a wafer level package process.

10       10.   A method of production of an electronic device having mounted thereon a microelectromechanical system element, which comprises the steps of:

15               forming a micromachine component and electronic component for operation of said micromachine component on a substrate to form said system element; and bonding to said substrate a lid covering an active surface of said substrate and provided with wiring patterns to define an operating space for said micromachine component and electrically connecting said electronic component and the wiring patterns of said lid at a bonded part of said substrate and said lid.

25       11.   A method of production of an electronic device as set forth in claim 10, in which said bonded part is formed by ultrasonic bonding of said substrate and said lid.

30       12.   A method of production of an electronic device as set forth in claim 10 or 11, which further comprises a step of forming at said substrate and/or said lid a cavity at an operating spaceside thereof.

35       13.   A method of production of an electronic device as set forth in claim 10 or 11, which further comprises a step of arranging between said substrate and a lid having no wiring pattern an intermediate member provided with an opening for operation of said micromachine component and wiring patterns, and electrically connecting said electronic component and the wiring patterns of said

intermediate member.

14. A method of production of an electronic device as set forth in claim 11, which further comprises a step of forming, at said substrate, said lid, and an  
5 intermediate member arranged in accordance with need between said substrate and said lid, a second continuous ultrasonic bonded part in contact with at an outer periphery of said operating space side of said substrate and other members without interruption.

10 15. A method of production of an electronic device as set forth in claim 10 or 11, which further comprises a step of applying a sealing resin to the outside of said bonded part to surround and bond the same.

15 16. A method of production of an electronic device as set forth in claim 10 or 11, which further comprising batch-wise producing a plurality of said electronic devices at the same time by a wafer level package process, then cutting out the individual electronic devices.

20 17. An electronic device having mounted thereon a functional element, in which

an element-carrying space is defined by a device body and a lid covering the same,

25 said device body and said lid are sealed air-tight by a continuous ultrasonic bonded part formed in contact with the outer periphery of said element-carrying space side of said members without interruption,

30 said air-tightly sealed element-carrying space has arranged inside the space said functional element fixed to said device body and/or said lid, and

said functional element is electrically connected to an outernal element and others.

35 18. An electronic device as set forth in claim 17, which further comprises between said device body and said lid an intermediate member provided with an opening and wiring patterns.

19. An electronic device as set forth in claim 17

or 18, in which said functional element and said outernal element and others are electrically connected through an ultrasonic bonded part separately formed from said ultrasonic bonded part for air-tight sealing.

5           20. An electronic device as set forth in claim 17 or 18, which further comprises a bonded sealing resin surrounding an outside surface of said ultrasonic bonded part for air-tight sealing.

10           21. A method of production of an electronic device having mounted thereon a functional element, which comprising the steps of:

                  securing said functional element to a device body and/or lid; and

15                   bonding said device body and said lid to define an element-carrying space, forming a continuous ultrasonic bonded part at said device body and said lid in contact with an outer periphery of said element-carrying space side of said members without interruption, and thereby sealing air-tightly said element-carrying space.

20           22. A method of production of an electronic device as set forth in claim 21, which further comprises a step of arranging between said device body and said lid an intermediate member provided with an opening and wiring patterns.

25           23. A method of production of an electronic device as set forth in claim 21 or 22, which further comprises a step of forming an ultrasonic bonded part for use in electrical connection between said functional element and an outernal element and others, in addition to the step of forming said ultrasonic bonded part for air-tight sealing.

30           24. A method of production of an electronic device as set forth in claim 21 or 22, which further comprises a step of applying a sealing resin to the outside of said ultrasonic bonded part for air-tight sealing to surround and bond the same.

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25. A method of covering and securing a lid in an electronic device having mounted thereon a functional element, which comprises a step of forming securing regions in predetermined patterns at an outer periphery of a device body carrying said functional element, bringing corresponding parts of said lid into abutment with said securing regions, and sealing air-tight said device body and said lid by ultrasonic bonding.

26. A method of securing a lid in an electronic device as set forth in claim 25, which further comprises a step of arranging between said device body and said lid an intermediate member provided with an opening and ultrasonically bonding said intermediate member, said device body and said lid.

27. A method of securing a lid in an electronic device as set forth in claim 25 or 26, which further comprises a step of applying a sealing resin to an outside surface of the formed ultrasonic bonded part to surround and bond the same.